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INTERNATIONAL APPLICATION NO.

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TITLE OF INVENTION

*PRIORITYZING THE TRANSFER OF IMAGE FILES FROM A DIGITAL CAMERA TO A HOST COMPUTER

APPLICANT(S) FOR DO/EO/US

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Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. This is a **FIRST** submission of items concerning a filing under 35 USC 371.
2. This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 USC 371.
3. This express request to begin national examination procedures (35 USC 371(f)) at any time rather than delay examination until the expiration of the application time limit set in 35 USC 371(b) and PCT Articles 22 and 39(1).
4. A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. A copy of the International Application as filed (35 USC 371(c)(2))
 - a) is transmitted herewith (required only if not transmitted by the International Bureau).
 - b) has been transmitted by the International Bureau.
 - c) is not required, as the application was filed in the United States Receiving Office (RO/US)
6. A translation of the International Application into English (35 USC 371(c)(2)).
7. Amendments to the claims of the International Application under PCT Article 19 (35 USC 371(c)(3))
 - a) are transmitted herewith (required only if not transmitted by the International Bureau).
 - b) have been transmitted by the International Bureau.
 - c) have not been made; however, the time limit for making such amendments has NOT expired.
 - d) have not been made and will not be made.
8. A translation of the amendments to the claims under PCT Article 19 (35 USC 371(c)(3)).
9. An oath or declaration of the inventor(s) (35 USC 371(c)(4)).
10. A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 USC 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. A FIRST preliminary amendment or a SECOND or SUBSEQUENT preliminary amendment.
14. A substitute specification.
15. A change of power of attorney and/or address letter.
16. Other items or information: PCT/IPEA/416 PCT Notification of Transmittal of International Preliminary Examination Report

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17. The following fees are submitted:

Basic National Fee (37 CFR 1.492(a)(1)-(5)):

Neither international preliminary examination fee (37 CFR 1.482)
Nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
And International Search Report not prepared by the EPO or JPO \$970.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$840.00

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International preliminary examination fee paid to USPTO (37 CFR 1.482)
but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$670.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)
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Surcharge of \$130.00 for furnishing the oath or declaration later than

30 months from the earliest claimed priority date (37 CFR 1.492(e)).

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total Claims	6- 20 =	0	X \$18.00 =	\$ 0
Independent Claims	1- 3 =	0	X \$78.00 =	\$ 0
Multiple dependent claim(s) (if applicable)			+ \$260.00	\$
TOTAL OF ABOVE CALCULATIONS =				\$
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				\$ 0.00
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Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+ \$ 0.00
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Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) \$40.00 per property				+ \$ 40.00
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- a) A check in the amount of \$ _____ to cover the above fees is enclosed.

b) Please charge Deposit Account No. 05-0225 in the amount of \$40.00 to cover the above fees.
A duplicate copy of this sheet is enclosed.

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NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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**PRIORITIZING THE TRANSFER OF IMAGE FILES FROM A DIGITAL
CAMERA TO A HOST COMPUTER**

CROSS REFERENCE TO RELATED APPLICATIONS

5 Reference is made to commonly-assigned U.S. Patent Application
Serial No. 09/781,594 (docket 80,018), filed October 12, 2000, entitled
“Producing Icons For Accessing Image Files Transferred From A Digital Camera”
by Edward Wolf et al, and commonly assigned U.S. Patent Application Serial No.
_____ (docket 81,769), filed concurrently herewith, entitled “Accessing
10 Image Files Stored in a Digital Camera by a Host Computer” by Edward Wolf et
al.

FIELD OF THE INVENTION

This invention relates to the transfer of image files from a digital
15 camera to a host computer.

BACKGROUND OF THE INVENTION

Digital images are often produced by electronic still cameras, such
as the Kodak Digital Science DC265™ camera sold by Eastman Kodak Company.
20 Exemplary digital cameras are described in more detail in commonly assigned
U.S. Patent Nos. 5,828,406, 5,633,678, and 5,477,264, the disclosures of which
are incorporated herein by reference. These cameras include an image sensor, an
analog to digital converter, and a storage device for storing the digital image files.
There are many storage devices on which these digital images can be stored,
25 including floppy magnetic discs, hard magnetic disc drives, and solid state
memory (e.g., flash memory) cards.

The images can be download by removing the memory card (e.g.,
CompactFlash card) from the digital camera and inserting it into a card reader
attached to a host computer, or by connecting the digital camera and host
30 computer together via a cable (e.g., Universal Serial Bus) or wireless (e.g., IrDA)

interface. Software provided with the digital camera is typically installed on the host computer and used to control the camera interface. This software typically provides commands that allow thumbnail (i.e., reduced resolution) images and full size images to be transferred from the camera to the host computer.

5 One type of design for implementing such software is described in U.S. Patent No. 5,848,420, the disclosure of which is herein incorporated by reference.

Typically, there is a problem when a user transfers image files from a digital camera to a host computer. When the user selects an image to view, the
10 images have to be transferred from the digital camera to the host computer following the user selection. A problem associated with image transfer is the image files are transferred from the digital camera to the host computer only when the user requests that an image file be accessed or opened. When the user requests the image transfer, the entire transfer must be completed before the host computer
15 can operate on a requested image file.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved way to transfer prioritized image files from a digital camera to a host computer.

20 It is another object of the present invention to permit image files to be transferred from the digital camera to the host computer prior to the user requesting access to the image file.

These objects are achieved by a method for transferring to a host computer a plurality of image files captured by a digital camera in accordance
25 with an assigned priority and permitting interruption of such transfer to operate on an untransferred image, the method comprising the steps of:

- (a) storing the plurality of captured image files in a memory in the digital camera;
- (b) coupling the memory to the host computer so that the host
30 computer identifies the plurality of captured image files;

(c) automatically transferring the plurality of captured image files in the memory to the host computer in accordance with an assigned priority without a user request; and

5 (d) interrupting the image file transfer when a user requests the host computer to operate on a particular untransferred image file and returning to the remaining portion of the untransferred image files after the user requested image file is transferred so that the remaining untransferred image files are transferred to the host computer.

10 It is an advantage of the present invention that when the digital camera is connected to a host computer, the images are immediately transferred (prefetched) to the computer and stored (cached), as a background (low priority) task. Therefore, when the user selects an image to view, it can often be immediately provided from the host computer's hard drive, instead of having to be transferred from the digital camera following the user selection.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a digital imaging system including a digital camera and a host computer that implements the present invention;

20 FIG. 2 is a block diagram of software components in accordance with the present invention;

FIG. 3A illustrates an exemplary view of a screen on a display monitor of the host computer of FIG. 1 after the digital camera is connected to the host computer;

25 FIG. 3B illustrates an additional exemplary view of a screen on a display monitor of the host computer depicting icons which represent files (including image data and audio segment data) and directories (or albums);

FIG. 4A illustrates the image file structure when no audio has been recorded with the image (for example, file P0000046.jpg in FIGS. 3B); and

30 FIG. 4B illustrates the image file structure when audio has been recorded with the image (for example, file P0000047.jpg in FIGS. 3B).

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates a system which can be used for controlling a digital camera 10 attached to a host computer 40 using software contained on a compact disc (CD) 48 or other media in accordance with the present invention. The compact disc 48, containing the software that implements the methods described in this invention, is inserted into a well-known CD-ROM drive 46 in the host computer 40. Alternatively, the software can be stored on a floppy magnetic disc (not shown), a removable memory card 30, or another type of media. The 10 compact disc 48, floppy disc, or removable memory card 30, or an alternative type of digital storage media, is supplied to the user along with the digital camera 10.

The digital camera 10 produces digital images that are stored on the removable memory card 30. The digital camera 10 includes a lens 12 having an adjustable aperture and shutter (not shown) for focusing light from a scene (not shown) on an image sensor 14, for example, a single-chip color charge coupled device (CCD), using the well-known Bayer color filter pattern. The analog output signal from the image sensor 14 is converted to digital data by an analog-to-digital (A/D) converter 16. The digital data is processed by a processor 18, and the processed digital image file is provided to a memory card interface 20 which stores the digital image file on the removable memory card 30. Removable memory cards 30 are known to those skilled in the art. For example, the removable memory card 30 can include memory cards adapted to the PCMCIA card interface standard, as described in the *PC Card Standard, Release 2.0*, published by the Personal Computer Memory Card International Association, 15 Sunnyvale, California, September 1991. The removable memory card 30 can also be adapted to the Compact Flash interface standard, such as described in the *CompactFlash Specification Version 1.3*, published by the CompactFlash Association, Palo Alto, California, August 5, 1998.

The processor 18 performs color interpolation followed by color 30 and tone correction, in order to produce rendered sRGB image data. The rendered

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sRGB image data is then JPEG compressed and stored as an Exif version 2.1 file on the removable memory card 30. The Exif image format is defined in "Digital Still Camera Image File Format Standard, Exchangeable image file format for Digital Still Camera: Exif," JEIDA-49-1998, June 1998 by the Japan Electronics Industries Development Association (JEIDA) and the sRGB color space is described in "A standard default color space for the internet – sRGB" by Michael Stokes, et al., available at <http://www.color.org/sRGB.html>. The processor 18 also provides "thumbnail" size image data to an image display 22, such as a color liquid crystal display (LCD), which displays the captured image for the user to review. The digital camera 10 is controlled by a series of user buttons 24.

The digital camera 10 also includes a microphone 19 and an audio amplifier and A/D converter 21. After capturing an image, the user may press one of the user buttons 24 in order to record audio, for example, annotation by the photographer. The audio signals from the microphone 19 are amplified and converted to digital data by the audio amplifier and A/D converter 21. The audio signals may be compressed, for example, using the well-known IMA ADPCM compression algorithm, and stored as Flashpix Extension data within the Exif 2.1 image file. The Flashpix audio extension is defined in "Extension to Flashpix version 1.0, Embedded Audio Annotations", January 26, 1998 by the Digital Imaging Group, which is available at <http://www.digitalimaging.org/>.

The user buttons 24 also allow other camera features and operating modes to be selected. These modes can also be selected via the host computer 40. The features and modes include self-timer mode, flash mode, focus mode, exposure mode, white balance mode, picture quality (compression level) mode, resolution mode, sleep and power off times, quickview mode, video output format, and zoom position.

After a series of images have been captured by the digital camera 10 and stored on the removable memory card 30, the removable memory card 30 can be inserted into a memory card reader 42 in the host computer 40. Alternatively, an interface cable 36 can be used to connect between a host

interface 26 in the digital camera 10 and a camera interface 44 in the host computer 40. The interface cable 36 can conform to, for example, the well-known universal serial bus (USB) interface specification.

A central processing unit (CPU) 50 will be understood to use
5 software in accordance with the present invention that will be described in more detail with reference to FIGS. 2, 3A-3B, and 4A-4B. The CPU 50 is coupled to a display monitor 52 and a keyboard 54. A mouse 55 permits the user to readily communicate with the CPU 50. The CPU 50 is also connected to a hard drive 56 and to random access memory (RAM) 58. The CPU 50 also communicates with
10 networked devices via a network card 60. The network card 60 is connected to a second computer 62, a third computer 64 which serves as an internet service provider connection to the internet, and to a hardcopy printer 66.

FIG. 2 depicts a set of software components in accordance with the present invention for operation on an operating system, such as Windows 95 and
15 Windows 98 OS based PCs, which enable applications to communicate with one or more digital cameras. One of these software components, the installable file system (IFS) 70, is a connection dependent file system which enables applications to communicate with the digital camera 10 through a Win32 Application Programmers Interface (API) 71 as a file system of a hard drive memory. See, for
20 example, Chapter 16 of "Systems Programming for Windows 95," published by Microsoft Press, Redmond, Washington, Copyright 1996 by Walter Oney. Other components enable applications to access and set the camera properties, as well as initiate a capture of a new image by the digital camera 10.

A user mode Application Programming Interface (API) 72 controls
25 camera device operation, as well as accessing information recorded in the image file. Client applications 73 access the user mode API 72 through a set of component object model (COM) interfaces (not shown) that enable:

- * Detection/enumeration of cameras currently attached to the system;
- * Communication with a specific camera (including registration for
30 camera-related events); and

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* Accessing data associated with an image file (e.g., thumbnails, and audio segment data).

An image file is accessed through the Win32 API 71, which then accesses the Installable File System (IFS) 70. Whenever the disclosure refers to 5 accessing an image file, it will also be understood that a portion of an image file, such as an audio data segment, can be individually accessed, transferred, and operated on.

The user mode API 72 uses COM based interfaces. These 10 interfaces are responsible for accessing image file data including any associated data, such as audio segment data, data and time of image capture, originating device, and the like. FIGS. 4A and 4B show exemplary image files and their structural organizations. The image file in FIG. 4A is numbered 100a, and the image file in FIG. 4B is numbered 100b. The nomenclature used to describe the 15 image files 100a and 100b use acronyms which are well understood to those skilled in the art. The user mode API 72 also enables a user to control the operation of the digital camera 10. The operation of the digital camera 10 can be controlled via a network. More particularly, the host computer 40 (shown in FIG. 1) selectively operates on a plurality of image files captured by the digital 20 camera 10. Each image file includes at least one digital image. Typically the image file includes audio segment data. Under the control of the host computer 40 or, alternatively, under the control of a user of the digital camera 10, a plurality of captured image files is stored in the removable memory card 30 in the digital camera 10. The digital camera 10 is connected to the host computer 40, and the host computer 40 identifies the plurality of captured image files stored on the 25 removable memory card 30. In accordance with the present invention, the host computer 40 identifies the removable memory card 30 as though it were a file system of an additional hard drive memory for accessing the captured image files. The host computer 40 accesses and selectively transfers the captured image files from the removable memory card 30 to the RAM memory 58 of the host computer 30 40.

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The Installable File System (IFS) software component 70 enables the operating system to view the digital camera 10 as a file system of an additional hard drive memory. The IFS 70 can be considered to have two components. The first is an external component (IFS-E) which satisfies operating system requests, 5 such as notifying the operating system (OS) of new files and obtaining and relinquishing drive letters from the OS. The second is an internal component (IFS-I) which manages tracking and caching of files. IFS-I also provides convenient storage and flexible information retrieval to other layers.

A Camera Manager 80 software component is responsible for 10 enabling several of the other components to work together. When the Camera Manager 80 receives a "Camera Arrival" event to identify that the digital camera 10 has been connected to the host computer 40, it notifies the IFS 70 to obtain a drive identification alphabetic letter (i.e., 3 ½ floppy drive (A:) shown in FIG. 3A) from the system and then populate the drive with file and folder information. The 15 Camera Manager 80 maintains camera instance information, such as the link between the unique identification assigned by a Camera Layer 84 software component and the drive identification alphabetic letter that the IFS 70 obtains from the system. When the Camera Manager 80 receives a "Camera Departure" event to indicate that the digital camera 10 has been disconnected from the host 20 computer 40, it notifies the IFS 70 to remove the drive that was linked to the disconnected digital camera 10. The Camera Manager 80 is also responsible for determining what to do when the digital camera 10 is disconnected while an operation is in progress (or work is queued), and then reconnected at a later time.

A Work Queue Manager 82 software component facilitates image 25 files captured by the digital camera 10 to be transferred to the host computer 40 in accordance with an assigned priority. When a user requests the host computer to operate on a particular untransferred image file, the Work Queue Manager 82 causes the image file transfer to be interrupted and returns the operation to transfer the remaining portion of the untransferred image files to the host computer 40 30 after the user requested image file is transferred.

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The Work Queue Manager 82 also performs the following functions:

- * Passes requests between the Camera Layer 84 and the layers directly above the Work Queue Manager 82;
- 5 * Serializes work requests;
- * Provides buffers for the transfer of parameter and request data between other layers;
- * Routes requests to the proper software component; and
- * Manages callback information/asynchronous requests.

10

Once the Camera Layer 84 notifies the Camera Manager 80 of a new connection of a digital camera 10 to the host computer 40, the Camera Manager 80 can query for camera traits as follows:

- * Whether the digital camera 10 is a read only device;
- 15 * Whether the digital camera 10 is able to delete files;
- * Whether the digital camera 10 is able to rename files (without copying and deleting the file);
- * If the digital camera 10 is only capable of reading whole files;
- * If the digital camera 10 supports taking a picture while connected;
- 20 and
- * If the digital camera 10 contains support for the CoolFS module.

A Protocol Layer 86 is a software component which interprets generic commands which are passed through the Camera Layer 84 into commands that are understood by the camera firmware located in the Flash EPROM 29 (shown in FIG. 1). The Protocol Layer 86 determines what the true functionality of the digital camera 10 is (i.e., either interprets the generic command into the camera specific command(s) or returns an error). Once the Protocol Layer 86 interprets the requests into the camera specific commands, it then calls generic interface methods such as TransportSend and TransportReceive on a Transport

Layer 88 software component. This makes it possible to provide support for a newly connected digital camera 10 by creating only a protocol layer for that newly connected digital camera 10 without making any changes to the other layers (provided the required transport layer is already in place from a previously 5 connected camera). The Protocol Layer 86 is also the layer that exposes an image file with embedded sound as two separate files (one file being the image data, and the other file being the audio segment data).

A Transport Layer 88 is the software component responsible for packaging the protocol specific commands into the required transport format (e.g., 10 Win95/Win98 Serial, WINNT Serial, or USB) so they can be transmitted via the interface cable 36 to the host interface 26 of the digital camera 10.

The following is a review of the operation of accessing digital camera files from a host computer in accordance with the present invention:

The user connects the digital camera 10 to the host computer 40 15 using the host interface 26. The system detects that a camera device gets plugged in and notifies the Camera Layer 84 of the new device. Each time a digital camera 10 is connected to the host computer 40, a camera alias is created in the Protocol Layer 86. The camera alias acts as an address of the digital camera 10.

Information about the interface 44 is cached away by the Camera 20 Layer 84, and the Camera Layer 84 creates the unique camera alias for use in communication with the Camera Manager 80. This unique camera alias allows the Camera Manager 80 to specify what digital camera 10 it wishes to communicate with.

The Camera Layer 84 does a lookup in the registry to determine 25 what protocol driver in the Protocol Layer 86 corresponds to the Vendor ID / Product ID for the digital camera 10 which was attached and then loads that driver. Since the transport already knows that the digital camera 10 was detected, the following layers shown in FIG. 2 are now brought into operation: the Camera Layer 84, the Protocol Layer 86, and the Transport Layer 88.

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The Camera Layer 84 sends a "Camera Arrival" signal, including the unique camera alias, to the Camera Manager 80 indicating that the digital camera 10 has been detected. The Camera Manager 80 then creates its own software model of the camera to maintain information such as the camera's unique
5 alias (as known by the Camera Layer 84), as well as the drive identification alphabetic letter (as known by the IFS 70). This is one example of how the Camera Manager 80 connects the software components together.

The Camera Manager 80 then informs the IFS 70 that a new file system device has been installed. The IFS 70 obtains a new drive identification
10 alphabetic letter from the system, and then asks the Camera Layer 84 for the contents of the drive.

Directory information is retrieved by the Camera Layer 84 and sent back to the IFS 70 (as AddFile and AddFolder messages). The choice of whether to recursively send file and folder information or wait for the IFS 70 to request it
15 depends upon the various priorities embodied in the Camera Layer 84.

A Client Application 73 sends a command through the User Mode API 72, or through the Win32 API 71. If the request came through the Win32 API 71, then it is transmitted through the IFS 70 software component.

Camera modeling information is retrieved from the Camera
20 Manager 80 and the request is passed to the unique camera alias on the Work Queue Manager 82. The request is picked up by the Camera Layer 84 which uses its own camera modeling information to determine what protocol driver in the Protocol Layer 86 to forward the request to.

The protocol driver then reformats the generic Camera Layer 84
25 command into camera specific command(s). Such commands can include determining what images are stored in the removable memory card 30 of the digital camera 10 and reading information from the removable memory card 30, setting the date and time properties of the digital camera 10. The camera specific command(s) are then sent to the Transport Layer 88 which sends them via the

interface cable 36 to the digital camera 10. Any reply from the camera is retrieved and sent back up the chain in reverse order.

The following is used to transfer image files from the removable memory card 30 of the digital camera 10 to the host computer 40 in accordance
5 with an assigned priority and permit the interruption of such transfer to operate on an untransferred image. When the digital camera 10 is connected to the host computer 40 and there are no user commands or OS file requests, low priority read requests are assigned by the Camera Manager 80 and cause the low priority image files to be transferred during idle time on the host computer 40. This process is
10 also known as pre-fetching. The host computer 40 transfers the image files one at a time from the removable memory card 30 of the digital camera 10 to the host computer memory (i.e., RAM 58 or the hard drive 56).

When the Client Application 73 software component requests that an image file in the digital camera 10 be transferred, there are two conditions.
15 First, if the requested image file has been prefetched or already transferred to the host computer 40, the prefetched image file can be rapidly accessed and displayed from either the hard drive 56 or the RAM memory 58. It is not necessary to transfer the image file from the digital camera 10 to the host computer 40 over the limited bandwidth interface which would provide a slower response time to the
20 user. In this instance, the IFS 70 software component appears to be making a request to retrieve data from a file stored in the digital camera 10, but it is actually retrieving the file from the hard drive 56 or RAM memory 58 of the host computer 40.

In the second condition, the digital camera 10 is in the process of
25 transferring low priority image files to the host computer 40 and the particular image file requested has not yet been transferred. In this instance, the IFS 70 software component sends a higher priority request to the Work Queue Manager 82, and the Camera Layer 84 responds to the Work Queue Manager 82 and recognizes a higher priority request. The Work Queue Manager 82 causes the
30 interruption of the low priority image file transfer and requests the Camera Layer

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84 to operate on the particular higher priority untransferred image file. After this operation is completed in a manner discussed above, the Work Queue Manager 82 returns to its lower priority requests and continues the transfer of the low priority image files.

5 If the user disconnects the digital camera 10 from the host computer 40, the Camera Layer 84 is notified about this disconnection and blocks all requests targeted for that digital camera 10. The Camera Layer 84 then sends a "Camera Departure" signal to the Camera Manager 80. Note that there generally are two common serial transports associated with digital cameras. They are
10 referred to as RS-232 and Universal Serial Bus (USB). In the case of an RS-232 transport, the Camera Layer 84 detects the disconnection by a failure of communication. The Camera Manager 80 then notifies the IFS 70 of the disconnect, and the IFS 70 removes the drive identification alphabetic letter from the host computer 40. The Camera Layer 84 then completes the remaining
15 requests for the digital camera 10 from the Work Queue Manager 82.

FIG. 3A illustrates an exemplary view of a screen on a display monitor 52 of the host computer 40 after the digital camera 10 is connected to the host computer 40. This illustrates that the digital camera 10 appears as another drive in the host computer 40. For example, as shown in FIG. 3A, A: is a floppy drive, C: and D: are hard drives, E: is a CD-ROM, and F: is the DC290 digital camera. The left side of the screen shows the storage capacity of the digital camera 10 and how much storage is currently consumed, which is what the user would see for any drive on the host computer 40.
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FIG. 3B illustrates an additional exemplary view of a screen on the display monitor 52 of the host computer 40 depicting icons which represent files (including image data and audio segment data) and directories. The shown representative directory is an album.
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In accordance with the present invention, the image files stored in the digital camera 10 can be accessed (e.g., viewed, copied or deleted) over a network, including the internet, and the digital camera 10 can be controlled via the
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network (e.g., take a new image by "selecting" an appropriate "current picture" file icon). The file current.jpg depicted in FIG. 3B enables a user to take a new picture from either the host computer 40 or one of the network computers (i.e., computer 62 or computer 64 shown in FIG. 1) when the digital camera 10 is connected via
5 the host interface 26 to the host computer 40. When the user opens the file current.jpg, the Win32 API 71 provides this user request to the IFS 70 software component. This request is passed down through the various software layers to the digital camera 10.

When the user opens the current.jpg file on the host computer 40,
10 the digital camera 10 exposes a new image onto the image sensor 14, processes the image, and temporarily stores the processed image in the RAM memory 28. The Protocol Layer 86 monitors the digital camera 10, which responds when the image has been captured and stored. The image is then automatically transferred from the digital camera 10 to the host computer 40 and stored in the host
15 computer's memory (e.g., RAM 58 or hard drive 56), and displayed to the user on the display monitor 52 of the host computer 40. Thus, by simply opening the particular image file, the user is able to instruct the digital camera 10 to capture a new image and to immediately display the captured image on the host computer 40 either locally or via the network.

In accordance with the present invention, the host computer 40 identifies and selectively transfers at least one image file captured by the digital camera 10 which includes a digital image and at least one audio data segment. After storing the captured image file in the removable memory card 30 of the digital camera 10, the digital camera 10 is connected to the host computer 40 via
25 the interface cable 36. The host computer 40 then identifies the captured image file and recognizes the presence of the digital image and the audio data segment stored in the removable memory card 30.

As shown in FIG. 3B, at least two icons are provided on the display monitor 52 of the host computer 40 which respectively represent the digital image
30 and the audio data segment. The digital image file is shown as file P0000047.jpg.

* * * * *

Even though P0000047.jpg is a single file, the audio data segment is represented as a separate wave file P0000047.wav along with the image file. A user can then selectively access the digital image icon or the audio data segment icon to cause the digital image or the audio data segment to be transferred from the removable memory card 30 of the digital camera 10 to the host computer 40.

FIG. 4A illustrates the image file structure when no audio has been recorded with the image (for example, file P0000046.jpg in FIGS. 3B). FIG. 4B illustrates the image file structure when audio has been recorded with the image. This is shown as file P0000047.jpg in FIG. 3B. Even though P0000047.jpg is a single file, the audio gets exposed as a separate wave file P0000047.wav along with the image file as shown in FIG. 3B.

In accordance with the present invention, when the user opens an audio data segment of a particular image file, i.e., if the user double clicks on the P0000047.wav icon of FIG. 3B in order to use their default sound player to play back this audio file, the Win32 API 71 issues a read request to the IFS 70. The two transfer conditions previously specified are then invoked to determine how to operate on the requested image file. If the audio data segment file has not yet been transferred to the host computer 40, then the Protocol Layer 86 receives the read request and determines the associated image file. The Protocol Layer 86 then reads only the audio data segment from the corresponding image file on the removable memory card 30 of the digital camera 10 and reformats it to be in the appropriate form.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

A B O D E M E M O R Y C A R D

Parts List

- 10 digital camera
- 12 lens
- 14 image sensor
- 16 A/D converter
- 18 processor
- 19 microphone
- 20 memory card interface
- 21 audio amplifier and A/D converter
- 22 image display
- 24 user buttons
- 26 host interface
- 28 RAM memory
- 30 removable memory card
- 36 interface cable
- 40 host computer
- 42 memory card reader
- 44 camera interface
- 46 CD-ROM drive
- 48 compact disc
- 50 central processing unit
- 52 display monitor
- 54 keyboard
- 55 mouse
- 56 hard drive
- 58 random access memory
- 60 network card
- 62 second computer
- 64 third computer
- 66 hardcopy printer

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Parts list cont'd

- 70 Installable File System
- 71 Win32 application programmers interface
- 72 user mode application programming interface
- 73 Client Applications
- 80 Camera Manager
- 82 Work Queue Manager
- 84 Camera Layer
- 86 Protocol Layer
- 88 Transport Layer
- 100a image file
- 100b image file

WHAT IS CLAIMED IS:

1. A method for transferring to a host computer a plurality of image files captured by a digital camera in accordance with an assigned priority and permitting interruption of such transfer to operate on an untransferred image, the method comprising the steps of:

(a) storing the plurality of captured image files in a memory in the digital camera;

(b) coupling the memory to the host computer so that the host computer identifies the plurality of captured image files;

(c) automatically transferring the plurality of captured image files in the memory to the host computer in accordance with an assigned priority without a user request; and

(d) interrupting the image file transfer when a user requests the host computer to operate on a particular untransferred image file and returning to the remaining portion of the untransferred image files after the user requested image file is transferred so that the remaining untransferred image files are transferred to the host computer.

2. The method of claim 1 wherein the interruption step further includes determining if an image file has already been transferred or if it is only present in the memory in the digital camera, and if the image file has been transferred, operating on such transferred image file, but if the image file has not been transferred, transferring the image file to the host computer and then operating on the transferred image file.

3. The method of claim 1 wherein the memory is a removable memory card.

4. The method of claim 1 wherein the memory is a PCMCIA card.

5. The method of claim 1 further including the step of storing the transferred images into a predetermined location of a host computer memory and when the user requests the host computer to operate on a particular image file stored in the host computer memory, the transfer of the image files is uninterrupted.

6. The method of claim 1 wherein the host computer identifies the digital camera memory as though it were a file system of an additional hard drive memory for accessing the image files.

ABSTRACT

A method is disclosed for transferring to a host computer a plurality of image files captured by a digital camera in accordance with an assigned priority and permitting interruption of such transfer to operate on an untransferred image. The plurality of captured image files are stored in a memory in the digital camera. The memory is coupled to the host computer so that the host computer identifies the plurality of captured image files. The plurality of captured image files in the memory are then automatically transferred to the host computer in accordance with an assigned priority without a user request. The image file transfer is interrupted when a user requests the host computer to operate on a particular untransferred image file and the operation returns to the remaining portion of the untransferred image files after the user requested image file is transferred so that the remaining untransferred image files are transferred to the host computer.

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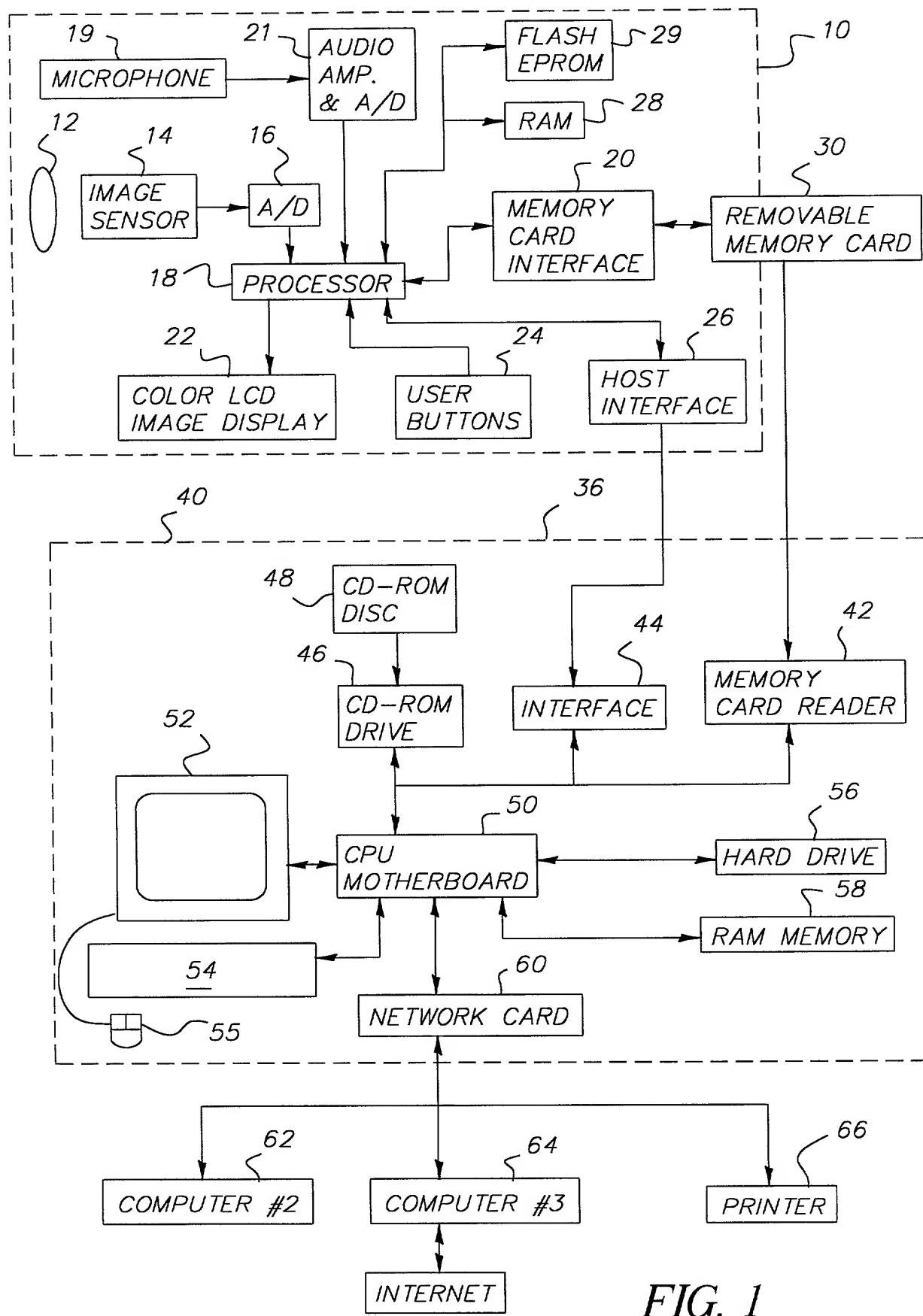


FIG. 1

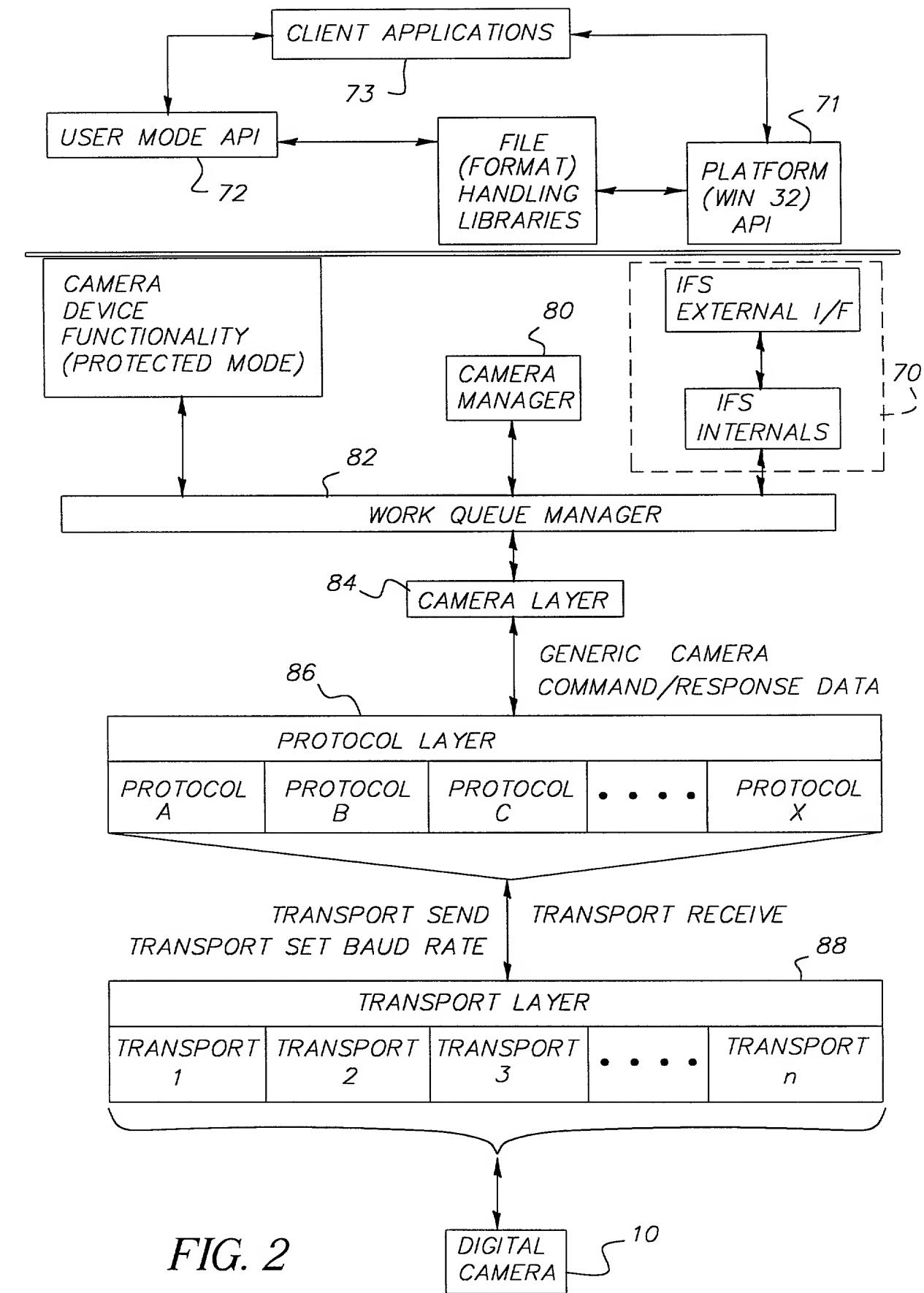


FIG. 2

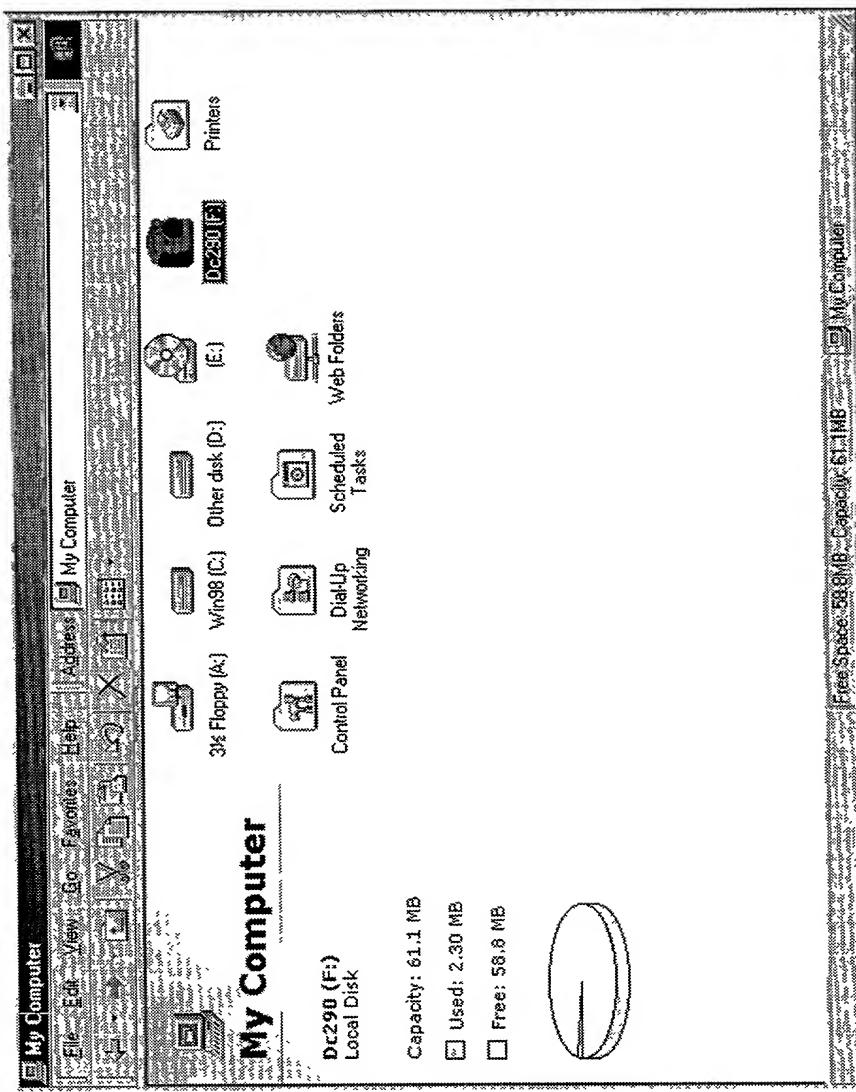


Fig. 3A

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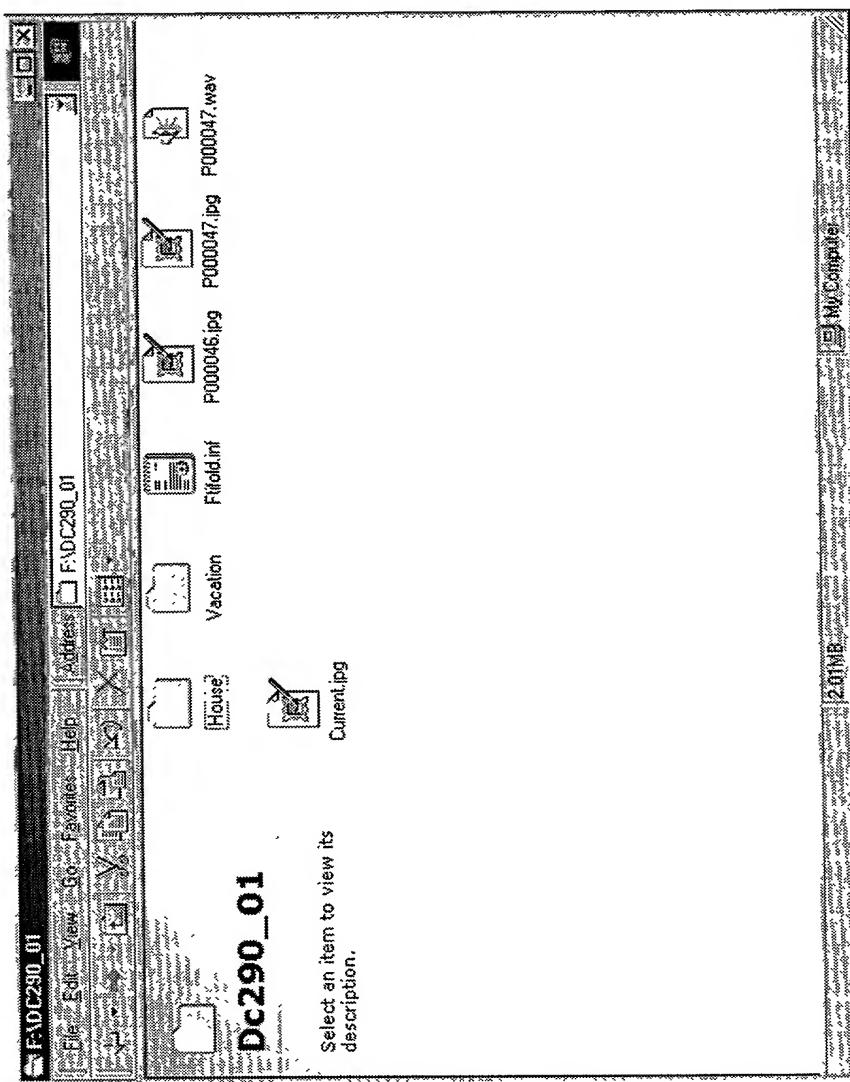


Fig. 3B

STRUCTURE OF APP1
SEGMENT

100a

IMAGE FILE

<i>SOI</i>	START OF IMAGE
<i>APP1</i>	APP1 SEGMENT WITH EXIF METADATA
<i>DQT</i>	QUANTIZATION TABLES
<i>DHT</i>	HUFFMAN TABLES
<i>SOF</i>	FRAME HEADER
	COMPRESSED MAIN IMAGE DATA
<i>EOI</i>	END OF IMAGE

APP1 MARKET
EXIF IDENTIFIER
TIFF HEADER
CAMERA MAKE
CAMERA MODEL
IMAGE ORIENTATION
EXPOSURE TIME
F/NUMBER
DATE/TIME CAPTURED
COMPRESSION LEVEL
SUBJECT DISTANCE
FOCAL LENGTH
THUMBNAIL
IMAGE DATA

FIG. 4A

100b

IMAGE FILE

<i>SOI</i>	START OF IMAGE
<i>APP1</i>	APP1 SEGMENT WITH EXIF METADATA
<i>APP2</i>	APP2 SEGMENTS WITH EMBEDDED AUDIO WAVE FILE
<i>DQT</i>	QUANTIZATION TABLES
<i>DHT</i>	HUFFMAN TABLES
<i>SOF</i>	FRAME HEADER
	COMPRESSED MAIN IMAGE DATA
<i>EOI</i>	END OF IMAGE

STRUCTURE OF APP1
SEGMENT

APP1 MARKET
EXIF IDENTIFIER
TIFF HEADER
CAMERA MAKE
CAMERA MODEL
IMAGE ORIENTATION
EXPOSURE TIME
F/NUMBER
DATE/TIME CAPTURED
COMPRESSION LEVEL
SUBJECT DISTANCE
FOCAL LENGTH
THUMBNAIL
IMAGE DATA

STRUCTURE OF APP2
SEGMENT

APP2 MARKER
FPXR IDENTIFIER
CONTENT LIST
APP2 MARKER
FPXR IDENTIFIER
WAVE FORMAT
AUDIO DATA

FIG. 4B

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Combined Declaration For Patent Application and Power of Attorney

ATTORNEY DOCKET
81770PRC

As below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Prioritizing the Transfer of Image Files from a Digital Camera to a Host Computer

The specification of which (check only one item below):

- is attached hereto.
- was filed as United States Application Serial No. on and
was amended on (if applicable).
- was filed as PCT international application Number and was amended on (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent & Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-*(d) or 365 (b) of any foreign application(s) for patent or inventor's certificate, or (365 (a) of any PCT international application(s) which designates at least one country other than the United States of America, listed below and have also identified below any foreign applications(s) for patent or inventor's certificate or any PCT international application(s) designating a least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (If PCT, indicate PCT)	APPLICATION NUMBER	DATE OF FILING (month/day/year)	PRIORITY CLAIMED UNDER 35 USC §119		
PCT	US00/28270	12 October 2000	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> NO
			<input type="checkbox"/>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/>	<input type="checkbox"/> YES	<input type="checkbox"/> NO

I hereby claim the benefit under Title 35, United States Code, 119 §(e) of any United States provisional application(s) listed below:

PRIOR PROVISIONAL APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. §119 (e):

PROVISIONAL APPLICATION NUMBER	FILING DATE (month/day/year)
60/159,162	13 October 1999

I hereby claim the benefit under Title 35, United States Code, §120 of any prior United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, §112, I acknowledge the duty to disclose to the U.S. Patent & Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR US APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 USC §120:

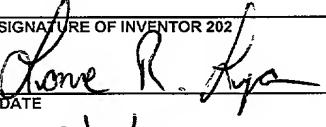
U.S. APPLICATIONS		STATUS (Check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		
US00/28270	12 October 2000		<input checked="" type="checkbox"/>	

POWER OF ATTORNEY: As a named inventor, I hereby appoint the attorney(s) and/or agent(s) associated with Eastman Kodak Company Customer No. 01333 to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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Patent Legal Staff Eastman Kodak Company 343 State Street Rochester, NY 14650-2201		Pamela R. Crocker (716) 477-0553 FAX: (716) 477-4646	

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2	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
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6	BUSINESS ADDRESS	CITY	STATE & ZIP CODE (COUNTRY)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE OF INVENTOR 201 	SIGNATURE OF INVENTOR 202 	SIGNATURE OF INVENTOR 203
DATE <u>5 Feb 2002</u>	DATE <u>2/5/2002</u>	DATE
SIGNATURE OF INVENTOR 204	SIGNATURE OF INVENTOR 205	SIGNATURE OF INVENTOR 206
DATE	DATE	DATE